

# Gestational Diabetes Mellitus (GDM)

- ❖ The increase in gestational diabetes is consistent with the current national obesity trends and epidemic of type 2 diabetes, further it poses a significant public health risk of obesity and glucose intolerance in children.
- ❖ Prenatal screening for GDM is important; however, there is controversy about whether screening should be universal or selective.
- ❖ The ADA (2008) and the Society for Maternal Fetal Medicine recommend screening for GDM using risk factor analysis at the first prenatal visit and later at 24 to 28 weeks by use of an oral glucose tolerance test (OGTT).
- ❖ According to the ADA, women with GDM are at extremely high-risk for developing type 2 diabetes and should be screened for diabetes six to twelve weeks postpartum and every one to two years to check for the development of diabetes or pre-diabetes.
- ❖ Clinical studies show a correlation between GDM and the lifelong risk of type 2 diabetes related to progressive beta cell failure due to overcompensation by the body for ongoing insulin resistance.
- ❖ The *2006 South Dakota Vital Statistics Report* indicated that 4.9 percent of mothers who gave birth in 2006 reported having gestational diabetes.

## What is gestational diabetes mellitus (GDM)?

Gestational diabetes mellitus (GDM) is defined as glucose intolerance that begins during pregnancy or is first recognized during pregnancy. The diagnosis is independent of whether management is limited to diet or requires insulin. It includes previously unrecognized glucose intolerance that predated pregnancy. Nationally, 7 percent of pregnancies are complicated by GDM. Current data suggests that the prevalence of GDM has increased over time, and parallels the increased prevalence of obesity nationwide. Approximately 700 cases of GDM occur each year in South Dakota.

GDM affects maternal-child health and is associated with a potential for preeclampsia, cesarean delivery, and type 2 diabetes in the mother, and with higher rates of perinatal mortality, macrosomia, birth trauma, hyperbilirubinemia, and neonatal hypoglycemia in the infant.

## Who should be screened?

The American College of Obstetricians and Gynecologists (ACOG) continues to recommend universal screening. Both the ADA and the Society for Maternal Fetal Medicine recommend using risk factor analysis at the first prenatal visit and later at 24 to 28 weeks if indicated by use of an oral glucose tolerance test (OGTT).

The U.S. Preventive Services Task Force (2006) concluded there was insufficient evidence to recommend universal screening for GDM, but more than 90 percent of obstetric physicians report screening all patients. The SD Diabetes Prevention and Control Program and the SD Diabetes Advisory Council currently recommend universal screening. The American Diabetes Association (2008) recommends screening for GDM using risk factor analysis and, if appropriate, use of an OGTT.

Patients at high-risk for GDM should undergo glucose testing as soon after confirmation of pregnancy as feasible, and then be retested at 24 to 28 weeks if the initial test is normal. Women at average risk should be screened at 24 to 28 weeks of gestation. The ADA continues not to recommend testing for low-risk women. Refer to Table 4 below for 2008 screening and diagnosis criteria.

While there is no definitive answer to the question of whether universal or selective screening is optimal, many medical centers choose to employ universal screening due to the difficulty involved in adhering to a selective screening protocol in a busy practice. Universal screening is the more sensitive strategy, identifying nearly all women with GDM. Because of the high incidence of overt diabetes later in life, and the opportunity to provide counseling regarding life style at an early stage, missing the diagnosis of GDM may have long-term adverse effects.

**Table 4: Screening for and Diagnosis of GDM (ADA, 2008 Standards of Medical Care)**

<b>Risk Determination</b>	<b>Risk Factors</b>
<b>Very High Risk for GDM</b> <b>Screening:</b> Screening should be conducted using standard diagnostic testing ( <i>fasting plasma glucose, symptoms of hyperglycemia, a casual plasma glucose <math>\geq 200</math> mg/dl, or a 2-hour plasma glucose <math>\geq 200</math> mg/dl during an OGTT</i> ) as soon as possible after confirmation of pregnancy at first prenatal visit	<ul style="list-style-type: none"> <li>❖ Severe obesity</li> <li>❖ Prior history of GDM or delivery of large-for-gestational age infant</li> <li>❖ Presence of glycosuria</li> <li>❖ Diagnosis of PCOS</li> <li>❖ Strong family history of type 2 diabetes</li> </ul>
<b>Higher Than Low Risk:</b> Includes all women of higher than low risk of GDM, including those above not found to have diabetes early in pregnancy  <b>Screening:</b> Should undergo GDM testing at 24 to 28 weeks of gestation	<ul style="list-style-type: none"> <li>❖ &gt; 25 years old</li> <li>❖ Abnormal weight before pregnancy</li> <li>❖ High risk ethnic/racial heritage (Hispanic American, Native American, Asian American, African American, or Pacific Islander)</li> <li>❖ Family history of either type 1 or type 2 diabetes in first-degree relatives</li> <li>❖ History of abnormal glucose tolerance</li> <li>❖ History of poor obstetric outcome</li> <li>❖ History of fetal macrosomia (infant weight &gt; 4000 grams)</li> </ul>
<b>Low Risk Status:</b> Is limited to any woman who meets all of the following criteria listed  <b>Screening:</b> Does not require GDM screening	<ul style="list-style-type: none"> <li>❖ Age &lt; 25 years old</li> <li>❖ Weight normal before pregnancy (body mass index of 25 or less)</li> <li>❖ Member of an ethnic group with a low prevalence of GDM</li> <li>❖ No known diabetes in first-degree relatives</li> <li>❖ No history of abnormal glucose tolerance</li> <li>❖ No history of poor obstetric outcome</li> </ul>

## What screening test result should be used as a threshold for subsequent diagnostic testing?

In the US, the current standard screening test is a 50-gram oral glucose load (either fasting or non-fasting) followed by a plasma glucose level one hour after the load. For those women who exceed the chosen threshold on a 50-gram screening, a diagnostic 100-gram OGTT may be performed on a separate day, if indicated.

In the recent past, the ADA recommended specifically that a screening result of 140 mg/dl warranted confirmation. In 2000 the ADA no longer recommended a specific threshold level, rather it suggested that a prudent threshold lies somewhere between 130 mg/dl and 140 mg/dl. A threshold of 140 mg/dl will miss 20 percent of women with GDM, whereas a threshold of 130 mg/dl will miss 10 percent of women with GDM. However, the more sensitive but less specific threshold of 130 mg/dl will result in more false positive results. For example, 25 percent of all patients will screen positive when a threshold of 130 is used and will require a three-hour oral glucose tolerance test.

The ADA suggests that administering a fasting 100-gram three-hour oral glucose tolerance test (OGTT) as an initial test may be appropriate in high-risk individuals or in high-risk populations. New data obtained from ACOG Fellows indicate that they are becoming more comfortable managing GDM and are following the universal screening with a 50-gram glucose one-hour test, medical nutrition therapy, exercise, and SBGM in patients identified with gestational diabetes. More than half of those surveyed indicated they evaluated their patients with the 75-gram, two-hour oral glucose tolerance test.

## How is the diagnosis of GDM confirmed?

Confirmation of the diagnosis of GDM requires that two or more of the four plasma glucose values obtained during a fasting 100-gram three-hour oral glucose tolerance test (OGTT) be elevated. In 2000 the ADA adopted the Carpenter-Coustan definitions for the upper limits of normal for OGTT values (see table below).

**Table 5: Confirmation of Diagnosis of GDM**

<b>Upper limits of normal for OGTT</b>	
<b>Plasma glucose</b>	<b>Carpenter-Coustan (UVM/DHMC)</b>
Fasting	95 mg/dl
1-hour	180 mg/dl
2-hour	155 mg/dl
3-hour	140 mg/dl

## What prenatal monitoring should be done in women with GDM?

### *Glycemia*

Daily self-monitoring of blood glucose (SMBG) is superior to intermittent office monitoring of plasma glucose. For women treated with insulin, postprandial monitoring is superior to preprandial monitoring. Urine glucose monitoring is not useful.

### *Ketonemia*

Urine ketone monitoring may be useful in detecting inadequate caloric or carbohydrate intake in women treated with calorie restriction.

### ***Hypertensive disorders***

Serial blood pressure measurement is recommended. Serial urine protein measurement is recommended if hypertension exists.

### ***Fetal well-being***

Increased monitoring of fetal well-being is indicated if fasting blood glucose levels are  $> 105$  mg/dl or the pregnancy is post-term. The specific monitoring technique employed, the time of initiation of the monitoring, and the frequency of the monitoring are dependent on the uniqueness of each patient and the cumulative fetal risk from GDM and other medical/obstetric conditions.

### ***Asymmetric fetal growth***

Ultrasound measurement of fetal abdominal girth may be helpful in detecting women whose infants are at increased risk for macrosomia. Detection of asymmetrical growth, particularly during the third trimester, may identify fetuses that would benefit from maternal insulin therapy. Macrosomic fetuses are a risk factor for shoulder dystocia and cesarean section.

## **What treatment is prescribed for GDM?**

### ***Diet and exercise***

All women with GDM should receive individualized medical nutrition therapy by a registered dietitian consistent with current ADA recommendations. Obese women (BMI  $> 30$ ) whose caloric intake is reduced 30-33 percent ( $\sim 25$  kcal/kg actual weight per day) experience reduced hyperglycemia and lower triglyceride levels. Active lifestyles should be encouraged. Moderate exercise has been shown to lower maternal glycemia.

A previous 1998 study by Major et al. showed that restriction of carbohydrates to 35-40 percent of total calories decreased maternal glucose levels and improved maternal and fetal outcomes. It is important to note that caloric restriction can lead to ketonemia and ketonuria, which can affect the fetus. Therefore, it must be done with great caution.

### ***Pharmacologic therapy***

Insulin is the pharmacologic therapy that has most consistently been shown to reduce fetal morbidity when used in conjunction with medical nutrition therapy. The ADA recommends initiating pharmacologic therapy when medical nutrition therapy fails to keep fasting whole blood glucose levels  $< 95$  mg/dl, one-hour postprandial whole blood glucose levels  $< 140$  mg/dl, or two-hour postprandial whole blood glucose level  $< 120$  mg/dl. The goal of therapy is to maintain maternal glycemia below the above cut-off levels. Medication doses should be determined by whole blood/plasma assay finger stick measurements. Postprandial whole blood finger stick measurements are superior to preprandial measurements.

Currently, oral glucose-lowering agents are not generally recommended for use during pregnancy. Glyburide is not FDA approved for the treatment of gestational diabetes. The ADA feels that further studies are needed to establish its safety. Recent evidence gathered from clinical trials has shown the efficacy and safety of oral agents during pregnancy and suggests the use of oral agents during pregnancy warrants further study. One author concluded that poorly controlled glycemia was responsible for development of fetal anomalies, not the oral agents used to control hyperglycemia.

## **Is postpartum screening recommended?**

The ADA recommends that all women with GDM should be screened for glucose intolerance six to twelve weeks after delivery. Those women with a greater degree of glucose impairment during pregnancy have the greatest risk for persistence of glucose intolerance postpartum. All women with a history of gestational diabetes should be educated regarding lifestyle modifications and the risk of developing insulin resistance.

If postpartum glucose levels are normal, subsequent serial evaluation of glycemia should occur at a minimum of three-year intervals.

If the results at six weeks postpartum show impaired fasting glucose or impaired glucose tolerance, patients should be retested annually. All women with GDM should receive intensive medical nutrition therapy and prescribed individual exercise programs because of their very high risk of developing diabetes. Referral to practitioners with expertise in the education and care of adult diabetes is appropriate for women with postpartum impaired glucose levels.

Patients with abnormal postpartum glucose levels should be referred to practitioners with expertise in the management of diabetes.

## **What postpartum education is recommended?**

### ***Diet and exercise***

Women should be encouraged to maintain a normal body weight with a regimen of medical nutrition therapy and exercise in an effort to reduce insulin resistance.

### ***Medications***

Medications that increase insulin resistance (e.g. glucocorticoids and nicotinic acid) should be avoided if possible. The use of low dose estrogen-progesterone oral contraceptives is not contraindicated in women previously diagnosed with GDM.

### ***Symptoms of hyperglycemia***

Women should be educated about the symptoms of hyperglycemia and encouraged to seek medical attention with the advent of symptoms.

### ***Family planning and future pregnancies***

Family planning should be encouraged to assure optimal glycemia monitoring and regulation in subsequent pregnancies.

### ***Implications for offspring***

Women should be advised of the need for their offspring to be monitored for the development of obesity and glucose intolerance.

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